JOURNAL

OF THE

WASHINGTON ACADEMY OF SCIENCES

VOL. 17 JUNE 19, 1927 No. 12

BOTANY.—*New plants from Central America.*—IX. PAUL C. STANDLEY, U. S. National Museum.[1]

On the following pages are described thirteen new Central American plants, chiefly trees and shrubs. Of special interest are the two new species of *Weinmannia*, representatives of a genus of trees of which only a single species has been known previously from Central America. There is included in the present paper a description of a new species of *Hybanthus* from western Mexico.

Weinmannia Wercklei Standl., sp. nov.

Usually a large shrub or small tree but sometimes (according to Werckle) a large tree, the older branchlets slender, terete, dark reddish brown, the young ones compressed, densely puberulent, with short or elongate internodes; stipules soon deciduous, oval, 3–5 mm. long, broadly rounded at apex, green, glabrous within, sparsely or densely sericeous or strigillose outside; leaves simple, the petioles 2–3 (rarely 10) mm. long, puberulent or glabrous; leaf blades lance-oblong to ovate-oblong, mostly 3.5–5.5 cm. long and 1.2–2.3 cm. wide (on young sterile branches up to 12 by 6 cm.), acute or acuminate, acute at base, rather coarsely crenate-serrate, subcoriaceous, deep green above, glabrous, beneath paler, often brownish when dried, sparsely pilose, at least along the costa, with short appressed hairs, in age glabrate, the costa slender, prominent beneath the lateral nerves about 13 on each side, inconspicuous, nearly straight, extending to the margin; racemes terminal and axillary, pedunculate, densely many-flowered, the rachis 2–3 cm. long, puberulent, the pedicels slender, fasciculate, 2–5 mm. long, puberulent; calyx 5-parted, sparsely puberulent or glabrate, scarcely more than 1 mm. long, the lobes ovate, acute; filaments glabrous; ovary narrowly ovoid, densely whitish-pubescent, the styles glabrous, 1 mm. long.

Type in the U.S. National Herbarium, no. 678753, collected at San Cristóbal de Candelaría, Province of Cartago, Costa Rica, altitude 1,700 meters, by C. Werckle (*Pittier* no. 3685). The following sterile specimens are conspecific:

[1] Published by permission of the Secretary of the Smithsonian Institution. For the last preceding paper of this series see page 245 of this volume of THE JOURNAL. Received March 30, 1927.

COSTA RICA: La Palma, Province of San José, alt. 1,450 m., *Biolley & Tonduz* 12513; *Standley* 37990. Cerros de Zurquí, Province of Heredia, alt. 2,200 m., *Standley & Valerio* 50589. El Muñeco, Province of Cartago, alt. 1,500 m., *Standley & Torres* 51140. Santa María de Dota, Province of San José, alt. 1,800 m., *Standley* 41581.

Only one species of *Weinmannia*, *W. pinnata* L., with pinnate leaves, has been known heretofore from Central America. In its foliage characters *W. Wercklei* resembles *W. lamprophylla* Hieron., of Colombia, which has a glabrous ovary.

Weinmannia burseraefolia Standl., sp. nov.

Tree, the older branchlets blackish, with short internodes, glabrous; stipules broadly oval, persistent and recurved, green, coriaceous, glabrous; leaves pinnate, the petiole 1.5–1.8 cm. long, sulcate on the upper surface, glabrous, narrowly margined above, the rachis 3.5–4 cm. long, sparsely short-barbate at the nodes, elsewhere glabrous, narrowly winged between the lobes, the wings entire, 2–4 mm. in (combined) width; leaflets 9, oblong-elliptic to ovate-elliptic, 2.2–3.5 cm. long, 1–1.4 cm. wide, acutish to acuminate, sessile, the lateral ones oblique at base and acutish, the terminal one acuminately contracted at base; leaflets coriaceous, finely appressed-serrate, (serrations about 11 on each side), glabrous, lustrous above, slightly paler beneath, the costa very slender, prominent on both surfaces, the other venation inconspicuous.

Type in the U. S. National Herbarium, no. 1,306,224, collected in wet forest at Yerba Buena, northeast of San Isidro, Province of Heredia, Costa Rica, altitude 2,000 meters, February 28, 1926, by Paul C. Standley and Juvenal Valerio (no. 49848).

At the time of collecting the specimens the tree was recognized as distinct from the common *Weinmannia pinnata*, but it was impossible to discover fertile branches. Although the material is sterile, I have little hesitancy in describing it as a new species. From *W. pinnata* it differs in its acute, glabrous, closely serrate (not crenate) leaflets. In general appearance *W. burseraefolia* somewhat suggests *W. crenata* Presl, of northern South America.

Alchemilla pascuorum Standl., sp. nov.

Sarmentose perennial, the stems 10–30 cm. long, procumbent, often rooting at the nodes, with elongate internodes, slender, hirsute with long, slender, chiefly appressed hairs; basal and lower stem leaves slender-petiolate, the uppermost leaves sessile or short-petiolate; stipules connate into a sheath, cleft into narrowly oblong, green, sericeous lobes; lower petioles 2 cm. long or shorter, appressed-hirsute; leaf blades reniform, 2–4 cm. wide, deeply cleft into 5–7 lobes, these broadly cuneate-obovate, rounded at apex, deeply serrate above the middle, with narrow, obtuse or acutish teeth, green on the upper surface and sparsely sericeous, beneath grayish green, rather densely sericeous with long, slender, closely appressed hairs; blades of the uppermost leaves deeply 3-lobed; flowers green, cymose, in small dense clusters near or at the ends of the branches, the pedicels 1.5 mm. long or shorter; hypanthium globose-urceolate, 1.5 mm. long, densely sericeous; sepals and bractlets erect, subequal, 0.6 mm. long, the bractlets lanceolate, the sepals lance-ovate,

acute or acutish, sparsely sericeous or glabrate; achenes broadly ovoid, obtuse, somewhat compressed, 1 mm. long, dark brown, nearly smooth.

Type in the U. S. National Herbarium no. 1,228,245, collected in wet meadow at Las Nubes, Province of San José, Costa Rica, altitude about 1,800 meters, March 21, 1914, by Paul C. Standley (no. 38455).

This plant is frequent in the pastures of the high mountains of central Costa Rica, and the following collections may be cited:

COSTA RICA: Southern slope of Turrialba Volcano, near Finca del Volcán de Turrialba, alt. 2,000–2,400 m., *Standley* 35028, 34940. Las Nubes, *Standley* 38386. Río Birrís, *Standley* 35416. Fraijanes, alt. 1,600 m., *Standley & Torres* 47627.

On Turrialba the plant is called "mochililla." Like the other species, it is grazed by cattle.

Alchemilla pascuorum is a near relative of *A. venusta* Cham. & Schlecht., of Mexico and Guatemala, but in that the stems are hirsute with spreading hairs, and the leaves also are loosely hirsute.

ALCHEMILLA SUBALPESTRIS Rose, Contr. U. S. Nat. Herb. 10: 96. 1906

This species, known previously only from Mexico, may be reported from Costa Rica. It was collected near Finca La Cima, above Los Lotes, north of El Copey, altitude 2,100 meters, in December, 1925, *Standley* 42551.

ACAENA CYLINDROSTACHYA Ruiz & Pavón, Fl. Peruv. 1: *68, pl. 104, f. 2.* 1798

This species, apparently common in the central and northern Andes of South America, may now be reported from Costa Rica. It was collected by the writer (*Standley & Valerio* 43639, 43682) on Cerro de las Vueltas, Costa Rica, at 3,000 meters, in December, 1925. It is frequent in the paramos of this high peak. Although not a very conspicuous plant, it attracts attention because of its handsome leaves with beautiful silky pubescence. One other species of the genus, *Acaena elongata* L., is common in the higher mountains of Central America, and ranges northward to Mexico.

Oxalis Maxonii Standl., sp. nov.

Plants woody or suffrutescent, branched, ascending or recumbent, the branches up to 1 m. long, red-brown, pilose with short, straight, mostly appressed hairs and puberulent with short curved hairs, the internodes short or elongate; leaves palmately 3-foliolate, the petioles very slender, 1.5–5 cm. long, pilose with slender, ascending or appressed, whitish hairs; leaflets short-petiolulate, the petiolules less than 2 mm. long, pilose with stiff spreading white hairs, the blades ovate or broadly ovate, 2–4.5 cm. long, 1.2–2.3 cm. wide, acute to very obtuse at apex, obtuse to rounded-obtuse at base, the lateral leaflets asymmetric, smaller and more obtuse than the terminal one, thin, green and glabrous on the upper surface, ciliate, beneath paler, thinly appressed-pilose with slender hairs, often glabrate; cymes slender-pedunculate, about equaling the leaves, 2 to 4-flowered, the bracts linear, about 4 mm. long, the pedicels proper 2–3 mm. long, minutely appressed-pilose, shorter than the slender peduncles, the bractlets linear, minute; sepals 4.5–5 mm. long, lanceolate, acute or obtuse, erect, thinly pilose with short slender white appressed hairs, thin, greenish; petals yellow, 1.5 cm. long, rounded at apex, glabrous; filaments 7 mm. long, densely pubescent; styles

densely pubescent; capsule (immature) oval-globose, 4 mm. long, densely pubescent with short slender whitish ascending hairs.

Type in the U. S. National Herbarium, no. 675390, collected in brushy undergrowth near the river, El Boquete, Chiriquí, Panama, altitude 1,000 to 1,300 meters, March, 1911, by William R. Maxon (no. 4996). Here are referred the following additional collections from Chiriquí:

PANAMA: Along river in shade, El Boquete, *Pittier* 2970. Woods along Griffen Trail, Horqueta Mts., alt. 1,700 m., *Killip* 3527.

In general appearance this is like *O. acuminata* Schlecht. & Cham., of Mexico and Guatemala, but in the latter the flowers are smaller, and the long-acuminate leaflets are pubescent on the upper surface.

Picramnia longifolia Standl., sp. nov.

Shrub 2.5–3 m. high, the young branches slender, at first sparsely and minutely puberulent, densely leafy; leaves 17 to 21-foliolate, the petiole 2–3 cm. long, the rachis 14–20 cm. long, sparsely puberulent or glabrate, the leaflets alternate, rather distant, the petiolules 2–3 mm. long, puberulent; leaflets obliquely ovate to oblong-ovate or (the lowest) broadly ovate, 3–4.5 cm. long, 1–2 cm. wide, rather abruptly acuminate or long-acuminate to an obtuse tip, at base very oblique, acute on one side, obtuse or rounded on the other, deep green above, slightly paler beneath, sparsely and minutely puberulent on the costa, elsewhere glabrous; staminate inflorescence pedunculate, about 20 cm. long, the rachis sparsely puberulent, the inflorescence much interrupted, the glomerules sessile and distant, the panicle branched near the base, the branches 5–10 mm. long, the bracts about equaling the glomerules; staminate flowers scarcely 1.5 mm. long, short-pedicellate, 4-parted, glabrous or nearly so, the sepals oval; pistillate racemes (in fruit) pedunculate, 10–12 cm. long, simply racemose, the rachis very sparsely puberulent, the pedicels solitary or fasciculate, stout, 5–8 mm. long, glabrate, divaricate or ascending; sepals 4, rounded, persistent and spreading in fruit, minutely and densely appressed-pilose; fruit dark red, obovoid-globose, about 1 cm. long and 8 mm. thick, rounded at apex, glabrous.

Type in the U. S. National Herbarium, no. 1,307,021, collected in wet forest on Cerro de las Caricias, north of San Isidro, Province of Heredia, Costa Rica, altitude about 2,400 meters, March 11, 1926, by Paul C. Standley and Juvenal Valerio (no. 52211). No. 52108, from the same locality, belongs to this species.

Related to *P. quaternaria* Donn Smith, the most abundant *Picramnia* of Costa Rica, which differs in its less numerous leaflets and simple staminate inflorescences.

Hybanthus serrulatus Standl., sp. nov.

Plants herbaceous or suffrutescent (only upper part of plant at hand), about 60 cm. high, the branches green, sparsely or densely incurved-puberulous; leaves alternate, the stipules subulate, 1.5–2.5 mm. long, the petioles 4–8 mm. long, puberulent; leaf blades ovate, the larger 5 cm. long and 2.3 cm. wide, acuminate, obtuse to acute at base, thin, finely and closely crenate-serrate to the base, finely villosulous above with whitish hairs, beneath slightly paler, incurved-puberulous, especially on the nerves; flowers numerous, in racemes terminating short or elongate axillary branches; racemes 4 cm. long or shorter,

the pedicels 4–6 mm. long, widely ascending, finely puberulent, the bracts leaflike, lanceolate, 1.5 cm. long or shorter, those at the base of the pedicel filiform and stipule-like; sepals broadly ovate, obtuse, nearly 2 mm. long, green, densely scaberulous-puberulent; lower petal 2.7 mm. long, densely puberulent outside, narrowly spatulate, the blade much shorter than the claw, the other petals about equaling the sepals; capsule rounded-ovate, 3 mm. long, scaberulous, minutely rostrate at apex; seeds ochraceous.

Type in the U. S. National Herbarium, no. 386032, collected in clay soil in the Sierra Madre of Michoacán or Guerrero, Mexico, altitude 1,100 meters, November 4, 1898, by E. Langlassé (no. 558).

Related to *H. fruticulosus* (Benth.) Johnston, of Lower California, in which the much narrower leaves are remotely and unequally dentate or subentire.

Begonia Torresii Standl, sp. nov.

Plants perennial, erect (the base sometimes decumbent), 25–40 cm. high, branched, the branches few, ascending, short or elongate, succulent, short-villous or glabrate; stipules oblong to ovate, about 1 cm. long, obtuse, green, glabrous, tardily deciduous; petioles slender, 4–15 mm. long, short-villous; leaf blades oblong or ovate-oblong, sometimes broadest near the apex, 2.5–7 cm. long, 1–3 cm. wide, obtuse to acuminate, oblique at base, rounded on one side, very acute on the other, irregularly duplicate-serrate, often coarsely so, or laciniate-serrate, especially near the apex, the teeth usually setose-mucronate, at first often copiously short-villous on both sides but in age usually glabrate; peduncles 1 or few-flowered, slender, erect, equaling or longer than the leaves, glabrous, or sparsely villous below; flowers pink; bracts oval, 4–6 mm. long, green, glabrous; staminate sepals oval, 6 mm. long, glabrous, exceeding the petals; capsule green, glabrous, 2 cm. long and wide, rounded at base, abruptly contracted above into a stout beak 1 cm. long, the body of the capsule 3-lobed, the lobes divaricate, triangular, abruptly contracted into a short horn.

Type in the U. S. National Herbarium, no. 1,228,283, collected in wet forest at Las Nubes, Province of San José, Costa Rica, altitude about 1,900 meters, March 21, 1924, by Paul C. Standley (no. 38561). The following additional collections may be cited:

COSTA RICA: Las Nubes, *Standley* 38599, 38523, 38640, 38816. Southern slopes of Turrialba Volcano, near the Finca del Volcán de Turrialba, alt. 2,400 m., *Standley* 35338.

The species is named for Prof. Rubén Torres Rojas, in whose company part of the material was collected. *Begonia Torresii* belongs to the section *Casparya* (sometimes recognized as a distinct genus), and is related to *B. urticae* L.f., of Colombia. It is probably the plant reported from Costa Rica by A. De Candolle[2] as *Casparya urticae γ hispida*, although the description does not agree very well. The Colombian *B. urticae* differs from *B. Torresii* in its thicker, more obtuse and more densely pubescent, short-petioled leaves, and in its pubescent fruit.

Begonia Valerii Standl., sp. nov.

Erect herb, 1–1.5 m. high, the stem stout, leafy above, usually simple, densely pilose with soft spreading brownish several-celled hairs; stipules

[2] Prodr. 15[1]: 274. 1864.

lanceolate to ovate, 1.5–2 cm. long, attenuate, densely brown-pilose, soon deciduous; petioles slender, 8–17 cm. long, brown-pilose; leaf blades broadly oblique-ovate, 16–26 cm. long, 9–16 cm. wide, abruptly cuspidate-acuminate, very oblique at base and deeply cordate, densely, finely, and unequally dentate, thin, deep green above, thinly pilose with long spreading hairs or glabrate, beneath slightly paler, thinly pilose, especially on the nerves, with long, rather stiff, spreading hairs, about 10-nerved at base; peduncles 20–30 cm. long, thinly pilose, exceeding the leaves, the cymes lax or dense, several times dichotomous, many-flowered, 7–20 cm. broad, the branches sparsely pilose, the flowers umbellate at the ends of the branches; pedicels 5–15 mm. long, very slender, sparsely pilose; flowers white or pinkish; staminate flower with 2 sepals, these suborbicular, about 7 mm. long and wide, rounded at apex, rounded to subcordate at base, glabrous outside or sparsely pilose near the base; petals none; filaments united at base; capsule 3-lobed, 6 mm. long, sparsely pilose or glabrate, 2 of the wings very narrow, the third oval-oblong, horizontal, rounded at apex, about 1 cm. wide.

Type in the U. S. National Herbarium, no. 1,254,000, collected in wet forest at El Arenal, Guanacaste, Costa Rica, altitude about 500 meters, January 19, 1926, by Paul C. Standley and Juvenal Valerio (no. 45245). The following collections also are referred here:

COSTA RICA: El Arenal, *Standley & Valerio* 45287. Pejivalle, Province of Cartago, *Standley & Valerio* 46885, 46963, 47112.

In general appearance this resembles *B. involucrata* Liebm., which has glabrous pedicels and usually lobed leaves. *B. Biolleyi* C. DC., also closely related, is separated by its much more copious pubescence, that of the lower surface of the leaves consisting of long matted hairs.

Begonia Carletonii Standl., sp. nov.

Plants small, with short, densely leafy rootstocks 2–3 mm. thick, emitting numerous long fibrous roots and also slender stolons; stolons rooting at the nodes and bearing a single leaf, sometimes also a peduncle, at each node, the internodes 5–8 cm. long, sparsely setose-pilose; stipules lanceolate, about 9 mm. long, attenuate, persistent, thin, brown, pilose; petioles slender, 3.5–5 cm. long, pilose with long slender spreading brown hairs; leaf blades obliquely ovate, 6–9.5 cm. long, 2.7–5 cm. wide, long-acuminate, oblique at base and shallowly cordate, the basal lobes broadly rounded, palmately 8-nerved at base, the central nerve 3 times dichotomous, thin, sparsely setose-pilose on both surfaces, green above, paler beneath, the margin closely, finely, and unequally sinuate-dentate; peduncles equaling the leaves, 2 or 3-flowered, very slender, sparsely pilose; bracts and bractlets ovate or oblong, obtuse, 3 mm. long or shorter, erect, persistent; ovary densely villous; staminate flowers slender-pedicellate, the 2 sepals rounded-ovate, 6 mm. long, rounded-obtuse, rounded at base, sparsely pilose, the petals oblong-spatulate, 6 mm. long, rounded at apex, glabrous; capsule 7 mm. long, sparsely pilose, the 3 wings very unequal, the largest 6 mm. broad, obtuse, divaricate.

Type in the U. S. National Herbarium, nos. 1,081,658–659, collected in the region of Bocas del Toro, Panama, April 22, 1921, by M. A. Carleton (no. 206).

This begonia, although a small and inconspicuous plant, is exceptionally

neat in appearance. It is not closely related to any Central American species with which I am acquainted.

Oreopanax Donnell-Smithii Standl., sp. nov.

Tree, the young branches very thick, densely leafy, densely stellate-tomentose; bud scales densely tomentose; petioles slender, 6–21 cm. long, glabrous; blades of the larger leaves cordate-suborbicular to rounded-ovate, 19–24 cm. long, 16–18 cm. wide, rounded or very obtuse at apex, broadly rounded at base and shallowly cordate (sinus narrow, 1–1.5 cm. deep), chartaceous, entire, glabrous, deep green above, pale beneath, 5-nerved at base (with 2 inconspicuous slender lower nerves); blades of the leaves at base of inflorescence smaller, broadly ovate to oval, rounded at apex, broadly rounded or emarginate at base; panicles large, pyramidal, 20–30 cm. long and broad, the branches stellate-pubescent with minute ochraceous hairs; bracts 1–1.5 mm. long, triangular, divaricate; staminate flower heads dense, many-flowered subglobose, 5 mm. in diameter, forming lax racemes 5–13 cm. long, the peduncles stout, divaricate, 5–8 mm. long, stellate-pubescent; bractlets broad, rounded at apex, glabrate, ciliolate; corolla lobes 1.5 mm. long, ovate, obtuse; filaments slender, exceeding the corolla, the anthers oval, 0.8 mm. long.

Type in the U. S. National Herbarium, no. 355151, collected at Atirro, Province of Cartago, Costa Rica, altitude 600 meters, April, 1896, by John Donnell Smith (no. 6533). Here may be referred the following collections:

COSTA RICA: Río de las Vueltas, Tucurrique, alt. 635 m., *Tonduz* 13120 bis. Orosi, alt. 1,000 m., *Pittier* 1764.

This tree is a relative of *O. capitatum* (Jacq.) Decaisne & Planch., which has much narrower leaves. *Oreopanax Donnell-Smithii* resembles also *O. costaricense* March., but in that the inflorescence is glabrous.

Oreopanax nubigenum Standl., sp. nov.

Tree 6–10 m. high, the branchlets thick and stout, densely leafy, very sparsely stellate-pubescent or glabrous; scales of the leaf buds rounded, glabrous, ciliate, the stipule-like bracts enveloping the budding inflorescence as much as 6 cm. long, glabrous; petioles slender, 3.5–17 cm. long, glabrous; leaf blades broadly deltoid-rounded, often as broad as long, sometimes rounded-rhombic, 7.5–15 cm. long and broad, acute or abruptly acute, rarely obtuse, at base varying from truncate to obtuse but often very broadly cuneate, entire, coriaceous, glabrous, 5-nerved at base; fruiting panicles 9–17 cm. long, rather dense, the branches stellate-pubescent, the bracts 1.5–3 cm. long, triangular, acute, ciliate, divaricate; fruiting heads very numerous, containing 4–8 fruits, the peduncles stout, divaricate, 8–13 mm. long, stellate-pubescent; fruits subglobose, 5 mm. long, 6 or 7-celled, glabrous.

Type in the U. S. National Herbarium, no. 1,228,409, collected in wet forest at Las Nubes, Province of San José, Costa Rica, altitude, 1,800 meters, March 21, 1924, by Paul C. Standley (no. 38806). Represented also by the following collections:

COSTA RICA: Las Nubes, *Standley* 38711. Cerros de Zurquí, Province of Heredia, alt. 2,200 m., *Standley & Valerio* 50808.

This, also, is a relative of *O. capitatum* and of *O. Donnell-Smithii*. From the latter it is distinguished by the acute leaves, which are not cordate at base.

Sciadophyllum nicaraguense Standl., sp. nov.

Shrub 2.5 m. high; petiole 40 cm. long, stout, terete, obscurely strigillose or glabrate; petiolules stout, 4.5–13 cm. long, glabrate; leaflets (4 present on the single leaf available) oval-oblong, 24–32 cm. long, 9.5–15 cm. wide, broadly rounded at apex and caudate-cuspidate, the acumen 2–2.5 cm. long, attenuate, at base rounded, pergamentaceous, entire, concolorous, glabrous above or nearly so, somewhat lustrous, beneath dull, sparsely pubescent with minute appressed hairs, the costa and lateral nerves salient on both surfaces, the lateral nerves about 19 on each side, divaricate, curved near the margin and irregularly anastomosing, the ultimate nerves prominulous, closely reticulate; rachis of the inflorescence (only fragments present) ferruginous-tomentulose, the bracts deciduous; umbels few-flowered, the peduncles 6–8 mm. long, the pedicels about 3 mm. long, ferruginous-tomentulose; ovary tomentulose; calyx nearly 2 mm. broad; disk annular, fleshy; styles connate into a conic column nearly 2 mm. long.

Type in the U. S. National Herbarium, no. 1,082,152, collected at San Juan del Norte, Nicaragua, March 2, 1896, by C. L. Smith (no. 78).

Only incomplete material is available for study, but this is sufficient to prove the plant a distinct species. Only one other member of the genus, *S. systylum* Donn. Smith, is known from Central America. It grows in the mountains of Costa Rica. The flowers of *S. nicaraguense* resemble those of *S. systylum*, but the latter plant has copious stellate pubescence.

Dendropanax monticola Standl., sp. nov.

Tree 4.5–6 m. high, glabrous throughout, the older branchlets ochraceous; petioles slender, 1.3–6 cm. long; leaf blades ovate or elliptic-ovate, 7–13.5 cm. long, 2.5–6 cm. wide, acuminate or long-acuminate, rounded or very obtuse at base, pergamentaceous, entire, deep green above, slightly paler beneath, triplinerved, the lateral nerves 4 or 5 on each side, divergent at an angle of about 55 degrees, arcuate, slender, irregularly anastomosing close to the margin, the costa very slender; umbels few, few-flowered (flowers about 10), arranged in a terminal short-pedunculate umbel or in a short raceme; rachis of the raceme 1.6–4 cm. long, the umbels on peduncles 1.8–4 cm. long, the peduncles naked; pedicels 4–7 mm. long; ovary turbinate, nearly 2 mm. long, the calyx entire or remotely denticulate; petals green, obtuse or rounded at apex, 1.5 mm. long; stamens shorter than the petals; fruit not seen.

Type in the U. S. National Herbarium, no. 1,305,191, collected in wet forest near Fraijanes, Province of Alajuela, Costa Rica, altitude about 1,600 meters, February 12, 1926, by Paul C. Standley and Rubén Torres Rojas (no. 47538). The following collections represent the same species:

COSTA RICA: Fraijanes, *Standley & Torres* 47418. Cerro de las Caricias, Province of Heredia, alt. 2,000–2,400 m., *Standley & Valerio* 52051. La Ventolera, southern slope of Volcán de Poás, *Standley* 34687.

The nearest relative of this tree is *D. querceti* Donn. Smith, also Costa Rican, which has usually solitary umbels, and leaves which are broadest at or above the middle and narrowed at base.

Dendropanax praestans Standl., sp. nov.

Small tree, the branchlets stout, ochraceous, glabrous, densely leafy at the ends, the internodes very short; stipules very small, scarious, the margins

laciniate; leaves dimorphous, those of some branches merely dentate, those of other branches all or nearly all digitately trilobate, the petioles slender, 2–7 cm. long, glabrous; blades of the simple leaves ovate-oblong to ovate, 8.5–12.5 cm. long, 3.5–6 cm. wide, acuminate, at base obtuse or broadly cuneate, irregularly sinuate-serrate, the teeth obtuse, a few of them often much larger than the others, the leaves entire near the base or below the middle, 3-nerved at base, the lateral nerves about 5 on each side, arcuate-ascending; lobed blades about 13 cm. long and broad, broadly cuneate at base, lobed to within 3 cm. of the base, the lobes narrowly oblong, about 2 cm. wide, attenuate to apex, irregularly sinuate-serrate, the sinuses between the lobes rounded; leaves all subcoriaceous, glabrous, deep green above, paler beneath, minutely punctate, the venation prominent beneath; umbels many-flowered, arranged in a short-pedunculate terminal umbel, the peduncles of the ultimate umbels stout, 1.5–2 cm. long, naked or bearing near the base a short cuplike sheathing bract; pedicels stout, 4–5 mm. long, sparsely and minutely puberulent or glabrate; hypanthium hemispheric, the calyx very short, 3 mm. broad; petals triangular-oblong, acute, glabrous, 2–2.5 mm. long; stamens shorter than the petals, the filaments short, subulate; fruit subglobose, 5-celled, 5–6 mm. broad, glabrous; styles united for half their length.

Type in the U. S. National Herbarium, no. 677609, collected in wet forest of Cuesta de las Palmas, southern slope of Cerro de la Horqueta, Chiriquí, Panama, altitude 1,700 to 2,100 meters, March, 1911, by H. Pittier (no. 3213).

Here belong, probably, leaf specimens collected by myself (no. 41973) at Laguna de la Escuadra, northeast of El Copey, Costa Rica, at about 2,100 meters. These leaves are very large, about 30 cm. long, and deeply 5-lobed, the lobes coarsely serrate, or the terminal one pinnately lobed.

Among all the other North American species of *Dendropanax* (*Gilibertia*) this may be recognized at once by the toothed leaves.

ZOOLOGY.—*A new genus and species of frog from Tibet.*[1] LEONHARD STEJNEGER, U. S. National Museum.

In his Monograph of the South Asian, Papuan, Melanesian, and Australian Frogs of the genus *Rana*, Boulenger[2] described (p. 107) a series of ten frogs from Southern Tibet under the name of *Rana pleskei* (Guenther). The three localities: Lake Yamdok, 15,000 feet altitude, Kamba Jong [Kampadzong], and Gyantse are situated south of the Brahmaputra on the north slope of the Himalayas, north of the frontiers of Sikkim and Bhutan. Guenther's types came from western Szechwan, China.

The National Museum having recently received from the Rev. D. C. Graham good material of the true *Nanorana pleskei* and also, in exchange with the British Museum through the kindness of H. W. Parker, two specimens from Tingri, Tibet, not far from the general

[1] Received May 7, 1927.

[2] Rec. Indian Mus. 20: 1–226. 1920.

region whence came Boulenger's material, I am in a position to affirm that the latter belongs to a new species totally different from Guenther's species. In further confirmation, Dr. Thomas Barbour was kind enough to lend me for comparison a specimen from Yatong [Yathung] in the projecting angle of Himalayan Tibet between Sikkim and Bhutan.

Altirana, new genus

Diagnosis.—"Vomerine teeth, if present, much reduced; no tympanum; no stapes; fingers and toes not dilated at the tips; outer metatarsals separated by web in their distal third or fourth only; zygomatic branch of the squamosal short; omosternal style not forked at the base; terminal phalanges obtuse." (Boulenger.)

To this should be added that the precoracoid is as well developed as in *Rana* typified by *R. temporaria.*

Altirana parkeri, new species

Diagnosis.—Digits without terminal dilatations and horizontal grooves; tympanum absent; outer metatarsals separated in their distal third; no dorsolateral glandular fold; no long tooth-like protruberance in front of lower jaw; toes fully webbed; subarticular tubercles present but rather flat and indistinct; fifth toe slightly shorter than third; second and fourth fingers subequal; tibiotarsal articulation reaching the shoulder.

Type-locality.—Tingri, Tibet, at 15,000 feet altitude.

Type.—U. S. National Museum, No. 72328.

Measurements	U. S. N. M. No. 72328 ♂ ad. *Millimeters*	M. C. Z. No. 11636 ♂ ad. *Millimeters*
Tip of snout to vent	25.00	34.00
" " " " anterior border of eye	5.50	5.75
" " " " nostril	3.25	3.75
Nostril to eye	2.25	2.25
Longitudinal diameter of eye	3.60	4.00
Distance between nostrils	3.00	3.00
Interorbital width	2.00	2.00
Width of upper eyelid	2.50	3.00
Width of head	12.25	12.00
Fore leg	16.00	16.00
Hind leg from vent to tip of fourth toe	44.00	44.00
" " " groin " " " " "	43.00	42.00
Tibia	14.00	14.00
Foot from heel to tip of fourth toe	26.00	23.00

In view of Boulenger's careful account of the Himalayan specimens a detailed description of the type is not deemed necessary here, but I would call attention to the fact that Boulenger expressly states (p. 108) that males are "without secondary sexual characters," while the specimens before me clearly demonstrate the presence of a large nuptial pad-like swelling on the inner side of the first finger which is covered with minute dark spinules, as are also the

bases of the first and second fingers, a feature strongly developed in the Museum of Comparative Zoology specimen, and only slightly less in the type. The inference is that Boulenger's specimens were not collected during the breeding season.

Boulenger's reference of *Nanorana pleskei* to the genus *Rana* and especially his statement that the pectoral arch is as in *Rana temporaria*, which has strong and well ossified precoracoids, and that the tympanum is completely suppressed, undoubtedly misled Dr. Vogt into instituting the genus *Montorana*, with the species *M. ahli*, for specimens possessing a tympanum and having the precoracoid "very weak, thin as a thread, only imperfectly ossified." As a matter of fact, Vogt's *Montorana ahli* is the true *Nanorana pleskei*. Dr. Tsarevski, who at my request examined the types of the latter, writes me that the precoracoid "is very slender, very thin, with slight ossification."

It is consequently plain that Boulenger's *Rana pleskei*, which he regards as forming a distinct subgenus *Nanorana*, does not belong to it at all. He considers it as "a very aberrant species," "as a dwarfed, degraded form derived from the *Rana liebigii* group with which it is connected to a certain extent by *R. blanfordii*." It is quite possible that Boulenger is correct in this phylogeny, but the characters and combination of characters indicated in the diagnosis of his subgenus, and which I have adopted for the genus as above, are sufficient to set it off by itself from the rest of the unwieldy genus *Rana*.

I have named the species for Dr. H. W. Parker, in charge of the herpetological collection of the British Museum, in recognition of his help in clearing up important points connected with this investigation.

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

PHILOSOPHICAL SOCIETY

950TH MEETING

The 950th meeting was held at the Cosmos Club, February 5, 1927.

Program: N. H. HECK, *Observations while passing through an unusual waterspout formation on the Pacific Ocean.* The paper describes observations in the Pacific Ocean of water spout phenomena while actually in the formation by one who is not a meteorologist but who has had occasion during survey work in small craft to watch the weather very closely. Four spouts are described. The first was normal and of the type ordinarily seen. The second was very large, probably 1000 feet in diameter, forming a cylinder dropping from the clouds. With the spout complete the spray could be seen rising and falling on the edge of the spout as in a fountain, at least 600 feet above the surface of the sea. Surface of the sea was broken water after the spout disappeared instead of regular waves due to wind. The third spout was seen in process of formation when directly under cloud in which it was forming and it was seen that it formed between bands of cloud moving in

opposite directions. Fourth spout was very unusual. The spout tried to form and failed and series of bands of clouds reaching to sea surface from the cloud revolved around the axis of a cylinder remaining nearly vertical and parallel to each other. (*Author's abstract*).

The paper was discussed by Messrs. HEYL, HUMPHREYS, HAWKESWORTH, and AULT.

W. J. HUMPHREYS, *The tornado.* The tornado is far more frequent in the central and southeastern portions of the United States than in all the rest of the world. In tropical regions it is unknown. It occurs in the warm section of the cyclone more or less east of the windshift line.

In those portions of the United States where tornadoes are most frequent it appears that anticyclonic winds frequently overrun lower cyclonic winds, and produce a windshift line in midair independent, and well ahead, of the surface shift. This necessarily leads to strong local convections starting from this higher level, and at or near the boundary between the two systems of wind, cyclonic and anticyclonic. Furthermore, although the courses of these two winds over the earth cross each other, one being from the southwest, say, the other from the northwest, perhaps, nevertheless, if both are moving eastward with the same velocity, as may be the case, with reference to each other they will be moving in exactly opposite directions. That is, they will be flowing beside each other—not through or above and below each other—whatever their respective directions over the earth beneath. Convection between two such currents, dragging in material from each, necessarily produces rotation, and always in the same sense as that of the cyclone.

In short, then, the tornado is a joint product of cyclone and anticyclone generated by convection along a mid-air windshift line. It does not occur in tropical regions because there the anticyclone is unknown. (*Author's abstract*).

The paper was discussed by Messrs. FERNER, FRANKENFIELD, HECK, CROOK, TUCKERMAN, and PAWLING.

P. R. HEYL, presented an informal communication on the question as to the mass equivalent of energy as related to the medium in which energy is radiated. It was discussed by MESSRS. TUCKERMAN and ADAMS.

H. E. MERWIN, *Secretary.*

THE GEOLOGICAL SOCIETY

429TH MEETING

The 429th meeting was held at the Cosmos Club, April 13, 1927, President BUTTS presiding.

Informal communications: D. F. HEWETT described a fault plane exposed at the foot of Mt. Parnassus in Greece, which, because it appears less weathered than nearby inscriptions at Delphi, suggests movement of one or two feet within the past 2500 years.

Program: Professor DONALD H. MCLAUGHLIN, Harvard University: *Geology and physiography of the Andes in Central Peru.* The region discussed lies to the east of the city of Lima and includes the portion of the Andes between the well-known mining districts of Cerro de Pasco and Huancavelica. A detailed description has been published in the Bulletin of the Geological Society of America (**34**: 591–632. 1924.) and in Informaciones y Memorias de la Sociedad de Ingenieros del Peru (**37**: 69–107. 1925.) The papers are based on the work of the geological department of the Cerro de Pasco Copper Corporation.

The dominant rocks of the region are Mesozoic limestones and sandstone. They rest on somewhat metamorphosed Palezoic sediments, and are unconformably overlain by red shales and sandstones with various conglomerates which are provisionally placed in the Tertiary. Volcanic rocks (mostly pyroclastic) occur as an extensive formation between the Paleozoic sediments and the lowest limestones of the Mesozoic, and a later important accumulation of volcanic rock is found at the top of the geologic column, resting upon Tertiary (?) red beds. All the formations are intruded by numerous stocks and irregular masses of igneous rock, generally porphyritic in texture. Diorite, trachyte and quartz monzonite have been observed. The important deposits of copper and silver, for which the region is famous, are genetically related to small stocks of these relatively late intrusives.

The present Andes were formed by the warping uplift of a region of low relief, which was produced by long erosion that followed the last period of intensive deformation, probably in the early Tertiary. The uplift took place in three or more stages, and in certain areas appears to have been accompanied by some faulting. The ancient surface has been almost obliterated by the violent erosion on the steep western side of the range, but can still be seen in large areas situated between the great canyons of the streams of the eastern drainage which dissect the central plateaux. Glaciation formerly extended as low as 12,000 feet in favorable places and is responsible for the details of the topography in the summit regions. (*Author's abstract.*)

430TH MEETING

The 430th meeting was held at the Cosmos Club, April 27, 1927, President BUTTS presiding.

Program: F. L. HESS: *Notes on Florida phosphate deposits.* The production of phosphate from Florida is about 84 per cent of the entire United States production.

From limited observations near Bartow the phosphate gravel of the Bone Valley formation seems to be rolled pebbles, possibly from the Ocala limestone exposed near Dunellon, although there is a possibility that the pebbles may have come from phosphatic limestone in the lower part of the Alum Bluff formation. The phosphate pebbles are the only gravel found in a large area of Florida, and were apparently laid down in salt water, as shown by the presence of great numbers of dugong bones and shark teeth, but were close to land, as shown by the presence of numerous mastodon bones. It is not probable that the dugong bones were weathered from the underlying limestone because in places a number of ribs are sometimes found close together and apparently in their natural spatial relationships.

The phosphate pebbles are being leached, and apparently amorphous calcium phosphate is being deposited either in an irregular sheet under the richest beds of phosphate pebbles or in the sand along cracks carrying the drainage from the pebble beds. The fluorine content of the land pebbles ranges from about 1½ to 3½ per cent, and is utilized in Denmark and Belgium for the manufacture of sodium-fluo-silicate. The product is shipped to the United States, and a present attempt to have the duty on the material raised may result in the loss to Florida of its foreign phosphate trade.

As the phosphate is very cheap ($3 to $5 a ton) and is the only gravel to be obtained in a large area of Florida, it is used for concrete work and for macadamizing roads. (*Author's abstract.*)

G. F. LOUGHLIN: *Ore at Deep Levels in the Cripple Creek District, Colorado.* Study of deep mine workings in the southeast quarter of the Cripple Creek

volcanic breccia has on the whole verified the conclusions reached by Lindgren and Ransome in 1906 (U. S. Geol. Survey, Prof. Paper **54**), but has found that veins of telluride ores identical in mineral composition with those mined at comparatively shallow levels continue along master fissures to more than 3000 feet below the present surface or more than 5000 feet below the original surface of the volcano. The distribution of ore shoots is controlled by fissuring which was developed intermittently in part by local disturbances within the volcanic mass and in part by regional disturbance. A local structural feature of much importance is the small neck of basaltic breccia, along the margins of which the famous Cresson orebody has been mined.

The process of vein formation, though complicated in detail, is regarded for practical purposes as having taken place in three stages: the first characterized mainly by dark purple dense fluorspar accompanied by quartz and relatively coarse grained pyrite; the second by lighter purple fluorspar, quartz, dolomite, celestite, roscoelite, and tellurides; the third by vug linings of coarsely to finely crystalline quartz, fine drusy pyrite, a little fluorspar, and in the Dante mine considerable cinnabar.

Of special interest is a low grade pyritic ore formed in a mass of breccia in the Dante and Cresson mines and attributed to a process similar to "mineralization stoping" as recently described by Locke (Econ. Geol. **31**: 431). Ore shoots in the vicinity pitch in the direction of this breccia, which is believed to lie above a local source of ore-forming solution. Similar mineralized breccia has been found to the south in the Roosevelt Tunnel and the Ajax Mine.

The main deep vein in the Portland mine follows a fissured phonolite dike along the granite-breccia contact which here trends N. N. W. This trend is a local deflection along a contact of generally east-west trend and northward pitch. The productive part of the vein pitches northward parallel to the contact, and for the most part has a simple vein structure; but where the granite-breccia contact turns westward, the vein branches. The main part of it turns with the phonolite dike along a N. N. E. fissure. The N. N. W. part continues but is of comparatively low grade, but the ground between the two branches is cut by minor parallel N. N. E. veins which are productive for short distances. The structure here resembles that of the rich Captain and Hidden Treasure veins described by Lindgren and Ransome.

The northward pitch of the main deep Portland Ore shoot is in contrast to the southward pitch of ore shoots in the Bull Hill area to the north. Where the vein fissures of Bull Hill have been followed northward on the deepest levels of the Eagles Mine, they are tight and generally non-productive. Evidence as a whole indicates a downward convergence of productive ground southward from Bull Hill and northward from the Portland mine, towards a local source beneath the Last Dollar and Modoc mines. Future production from such deep ground depends more on cost of mining than on the downward persistence of telluride ore. (*Author's abstract.*)

PARKER D. TRASK and KIRTLEY F. MATHER: *Stratigraphy of the Lake Ainslie Region, Cape Breton Island, Nova Scotia.* The results presented here are due to joint work by the two authors during the summer of 1925, but the lot of obtaining the majority of the stratigraphic details fell to Mr. Trask, Mr. Mather concentrating his attention on unravelling the complicated structure of the region. The Lake Ainslie Region is located in central western Cape Breton Island, some 40 miles northeast of the Strait of Canso and about 75 miles west of Sydney. The following generalized section, based chiefly on sections made along the several Mabou Rivers, summarizes briefly the stratig-

raphy of the region. The formations, to which local names have been given, are for the most part continental in origin and vary considerably in thickness from the figures given. The formations described in the pioneer work of Fletcher (Can. Geol. Surv. Ann. Repts. 1875–1877 and later years) are subdivided, and although not personally compared, analogies between the formations of the Lake Ainslie Region and those of the Sydney Region, described by J. E. Hyde (Can. Geol. Surv. Summ. Rept. 1912: 392) and Hayes and Bell (Can. Geol. Surv. Mem. 133. 1923), are pointed out.

GENERALIZED SECTION OF FORMATIONS IN THE LAKE AINSLIE REGION, CAPE BRETON ISLAND, NOVA SCOTIA

	Thickness in feet
Pennsylvanian:	
Port Hood coal-measures:	
Highly cross-bedded sandstones and shales with intercalated coal seams. Thickness not measured	(?)
Important unconformity. (Port Hood measures rest on all formations from Super-Mabou to the Judique series.)	
Pennsylvanian (?) (In part perhaps equivalent to the Pt. Edward formation of the Sydney Region, which according to Hyde is Pennsylvanian.):	
Super-Mabou beds:	
Sandstones and shales, predominantly red in color	1500
Mabou formation:	
Chiefly gray shales, almost fissile. Numerous intercalated gray sandstones containing plant fragments. Some reddish zones and one zone, 15 feet thick and 500 feet above base of formation, of alternating laminae of gypsum and gray shale	1500
MacFarlane red beds:	
Red sandstones and shales. Some cross-bedding, but mostly fairly well stratified	1000
Middle Bridge formation:	
Chiefly dark gray thin-bedded shales, containing numerous creamy white thin limestone layers, some of which weather in a peculiar mammillary fashion	250
Total Pennsylvanian (?)	4250
Unconformity.	
Mississippian:	
Judique series. (In part at least of Windsor age. Comparable to the Windsor series of Hyde at Sydney. Core drilling recently conducted by Mr. K. C. Heald indicate that the Judique series is thicker and contains considerably more gypsum and limestone than given here.):	
Red sandstone and shale. Gypsum near base	500
Black oolitic limestone, in places characterized by an abundance of *Nucula?*	5–15
Red sandstone and shale	300–600
Yellow impure limestone and limestone breccia, which weathers in a peculiar honeycomb pattern. Fossiliferous in places	25–40
Red sandstone and shale. Some gypsum	100–200
Finely laminated gray shale	30
Bentonite and gray tuff. Found on Baddeck River	0–1
Finely laminated massive gray limestone. Very persistent and easily recognized by its peculiar ribbon-like structure	30
Red sandstone and shale	150
Total Mississippian	1550

Mississippian (?):
Dunbar series. (Comparable to middle division of Hyde's Mississippian at Sydney.):
Ainslie sandstone:

Fine to medium-grained cross-bedded sandstone	700
Gray and greenish sandstone and shale zones, the sandstones several hundred feet thick and the shales less than 100 feet	1500
Chocolate and dark red cross-bedded sandstones and shales	1200
Total Dunbar series	3400

Kewstoke conglomerate. (Comparable to the "Carboniferous conglomerate" series of Fletcher and Hyde.):

Chiefly massive coarse-grained arkosic sandstones and conglomerates which become progressively more fine-grained toward the top. Pinkish in some zones. Layers of impure coal 1000 feet from the top of the formation on S. E. Mabou River	150–3000
Total Kewstoke conglomerate	3000

Pre—Carboniferous:

Marbles, quartzites, gneisses, granites, volcanics, and chlorite schists	(?)

The yellow fossiliferous, cavernous limestone occurring in the middle of the Judique series at Middle River yielded the following fossils, which have been identified by Professor P. E. Raymond, of Harvard University, and are thought by him to be more closely allied with the Windsor fauna of the Magdalen Islands than with that of the Windsor District of Nova Scotia and to be of Middle or Upper Mississippian age: *Productus tenuicostiformis* Beede (common), *P. dawsoni* Beede, *Dielasma* cf. *D. sacculus* (Martin) (common), *Composita dawsoni* (Hall and Clarke) (rare), *Aviculopecten* sp., *Parallelodon dawsoni* Beede (rare). A very similar fauna was found by Hayes (Can. Geol. Surv. Summ. Rept. 1917 (F): 21) in a brown cavernous limestone near Sydney. (*Author's abstract.*)

W. P. Woodring, W. W. Rubey, *Secretaries.*

SCIENTIFIC NOTES AND NEWS

Neil M. Judd, Curator of American Archeology, United States National Museum, left Washington May 28th to complete his explorations at Pueblo Bonito, New Mexico, under the auspices of the National Geographic Society. This season's expedition is the seventh sent by the Society for the purpose of recovering and recording the story of this prehistoric Indian village.